

A Comparison of Oviposition Depth in Turf and Ornamental Plantings by Oriental Beetle (Coleoptera: Scarabaeidae)



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Abstract

Surface applications of imidacloprid, applied before or during oviposition, have been effective in controlling early instar oriental beetle (OB) grubs in turf. Evaluations of treated, field grown, woody ornamentals show imidacloprid to be less effective. Healthy OB grubs were found at depths greater than 30 cm in these plants. We hypothesized that OB lay eggs at greater depths in deep rooted versus shallow rooted plants. This led to a study comparing OB oviposition behavior in deep versus shallow rooted plants. The results were unexpected as the deepest oviposition depths occurred in turf instead of the deeper rooted dogwoods.

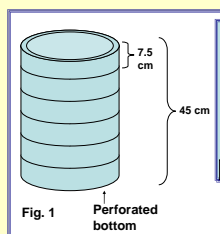
Introduction

The oriental beetle, *Exomala* (= *Anomala*) *orientalis* (Waterhouse), is an important grub pest of turf and ornamental nursery crops in northeast Ohio. Surface treatments of Merit/Marathon (imidacloprid) provide good control of white grubs in turf. In 2003, the Horticultural Insects Group, USDA-ARS, conducted a test using a method to apply imidacloprid 2 cm below the surface for white grub control in field grown nursery plants. Evaluation of control and imidacloprid treated plants found grubs throughout the root zones (30cm and deeper). Imidacloprid reduced grub numbers but only by 40% (M.E.R. unpublished). This led to the question of how deep the eggs were laid and if some were too deep to be exposed to the pesticide. A container test was devised to measure the depths of oviposition with the only variable being the type of plant. If eggs are laid deeper in nursery stock than previously thought, surface applied insecticides may not come in contact with eggs or young grubs. This information could influence pesticide application methods used in nurseries.

Objective: Examine oviposition behavior of oriental beetle in shallow (turf) versus deep rooted (dogwood) hosts.

Materials and Methods

- Cylindrical arenas (45 cm x 20 cm) were constructed of PVC pipe that could be taken apart at 6 intervals to look at each 7.5cm depth separately (Fig. 1).
- Three treatments with 5 replications were planted in the cylinders. The treatments were *Cornus* (Dogwood) (root systems measuring 30 to 43 cm long at time of planting (Fig. 2 and 3)), grass and no plant controls.
- Field soil from a nursery in northeast Ohio was used as the planting medium.
- Cylinders were set up in a container nursery in May and fertilized and watered as needed to establish good root development prior to infestation with OB adults.
- Oriental beetle grubs were collected during spring 2004 (from the same nursery as the soil) and reared in the laboratory to adults.
- Two mating pairs of adult beetles were caged on each test cylinder for 14 to 17 days (Fig. 4).
- Cages were removed and the cylinders were taken apart one section at a time for evaluation (Fig. 5 and 6).
- Each soil section was sifted to remove eggs and the eggs were counted (Fig. 7).



Results

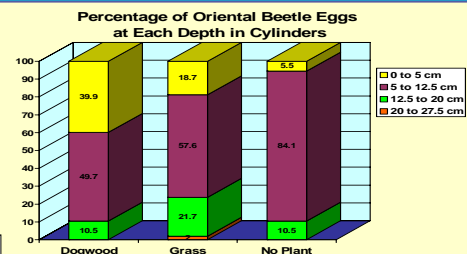
We hypothesized that eggs would be deposited deeper in the root zones of deep rooted versus shallow rooted plants. The data did not support our hypothesis (Table 1 and Fig. 8).

- Dogwood roots extended 45 cm deep yet 40% of the eggs in the dogwood cylinders were in the top 5 cm and no eggs were found deeper than 20 cm.
- Grass roots extended an average of 21 cm deep and 60% of the eggs were between 5 and 12.5 cm, with 2% found deeper than 20 cm.
- The no plant controls had 84% of the eggs in the 5 to 12.5 cm depth.

Table 1. Mean number of eggs per depth for each treatment

Depth in cm	Mean No. of eggs		
	Dogwood	Grass	No Plant
0 to 5	12.2	7.6	2.2
5 to 12.5	15.2	23.4	33.8
12.5 to 20	3.2	8.8	4.2
20 to 27.5	0	0.8	0

Chi-Square analysis was used to compare distributions between treatments and gave significant differences.



Discussion

The distribution of oriental beetle eggs in the cylinders was different than expected. In this study, all cylinders were irrigated equally, by hand, but the plant cover in the grass cylinders allowed the water to penetrate more evenly. In previous field studies the trees were irrigated with drip lines and the grass rows between the trees received no irrigation. We plan to repeat this study in 2005 using drip irrigation similar to what is used in field production nurseries. Further studies are planned to investigate the effects of moisture variation on oviposition depth and egg survival.